CLAIMS

1. An evaporator and condenser unit for use in distilling a liquid, the evaporator and condenser unit comprising:

a housing;

a motor for supplying rotary power within the housing;

a compressor having a compressor inlet for receiving a vapor generated within the housing and a compressor outlet for returning compressed vapor to the housing; and

a heat exchanger plate disposed within the housing and operatively coupled to the motor for rotation about an axis, the heat exchanger plate having a plurality of folds and two opposing edges that are joined together so as to give the folded plate a generally circular shape having a center that is coaxial with the axis of rotation, the folds defining a plurality of spaced-apart panels having corresponding surfaces that define alternating evaporating and condensing chambers between opposing panel surfaces, wherein

the evaporating chambers are in fluid communication with the compressor inlet so as to provide vapor thereto, the condensing chambers are in fluid communication with the compressor outlet so as to receive compressed vapor therefrom, and the evaporating and condensing chambers are sealed from each other.

2. The evaporator and condenser unit of claim 1 further wherein:

the evaporating and condensing chambers include inner and outer edges relative the axis of rotation;

the evaporating chambers are sealed at their inner edges by corresponding folds in the heat exchanger plate, and are open at their outer edges; and

the condensing chambers are open at their inner edges, and are sealed at their outer edges by corresponding folds in the heat exchanger plate.

3. The evaporator and condenser unit of claim 2 further comprising a first end plate and a second end plate disposed within the housing substantially perpendicular to the axis of rotation, the folded heat exchanger plate mounted between the first and second end plates so as to seal the evaporating chambers from the condensing chambers.

4. The evaporator and condenser unit of claim 3 wherein the housing includes a lower portion defining a sump containing the liquid to be distilled, the unit further comprises a plurality of liquid feed distribution ports extending through the second end plate such that a liquid flow path exists between the sump and the evaporating chambers via the liquid feed distribution ports during rotation of the heat exchanger plate.

5. The evaporator and condenser unit of claim 3 wherein the housing includes a lower portion defining a sump containing the liquid to be distilled, the unit further comprising:

at least one rotary scoop tube coupled to the second end plate and extending into the sump; and

a plurality of liquid feed distribution ports extending through the second end plate, the at least one rotary scoop tube and the liquid feed distribution ports cooperating provide a liquid flow path between the sump and the evaporating chambers during rotation of the heat exchanger plate.

6. The evaporator and condenser unit of claim 4 further comprising:

a flange mounted to an outer diameter edge of the first end plate opposite the heat exchanger plate, the flange cooperating with the first end plate to define a condensate collection space therebetween;

a plurality of condensate ports extending through the first end plate, the condensate ports providing fluid communication between condensate chambers defined by the folded heat exchanger plate and the condensate collection space; and

at least one stationary scoop tube extending through the housing and into the condensate collection space so as to remove condensate therefrom.

7. The evaporation and condensation unit of claim 6 further comprising a liquid distribution ring mounted to the second end plate opposite the heat exchanger plate and enclosing the liquid feed distribution ports, wherein the at least one rotary scoop tube is mounted to the liquid distribution ring and delivers liquid from the sump to the ring during rotation of the heat exchanger plate.

8. The evaporation and condensation unit of claim 4 further comprising a restriction element disposed in the evaporating chambers for generating a thin-film liquid flow on the panel surfaces of the evaporating chambers.

9. The evaporation and condensation unit of claim 8 further wherein each restriction element defines a corresponding gap in the respective evaporating chamber through which the liquid flows.

10. The evaporation and condensation unit of claim 9 further wherein:

the folded heat exchanger plate defines a central receiving space;

the compressor is mounted to the second end plate within the central receiving space defined by the folded heat exchanger plate;

the second end plate includes an aperture; and

the compressor inlet extends through the aperture in the second end plate.

11. The evaporator and condenser unit of claim 6 further comprising an annular weir mounted to the flange and extending into the condensate collection space, the weir configured to generate a column of condensate blocking the condensate ports in the first end plate.

12. The evaporator and condenser unit of claim 1 wherein the folds of the heat exchanger plate are co-planar with the axis of rotation.

13. A heat exchanger for use in a distiller having a supply of compressed vapor, a liquid to be distilled, and source of rotary power, the heat exchanger comprising:

heat exchanger plate operatively coupled to the source of rotary power for rotating the heat exchanger plate about an axis, the heat exchanger plate having a plurality

of folds and two opposing edges that are joined together so as to give the folded plate a generally circular shape having a center that is coaxial with the axis of rotation, the folds defining a plurality of spaced-apart panels having corresponding surfaces that define alternating evaporating and condensing chambers between opposing panel surfaces, wherein

the evaporating chambers are in fluid communication with the liquid to be distilled, the condensing chambers are in fluid communication with the supply of compressed vapor, and the evaporating and condensing chambers are sealed from each other.

14. The heat exchanger of claim 13 further wherein:

the evaporating and condensing chambers include inner and outer edges relative to the axis of rotation;

the evaporating chambers are sealed at their inner edges by corresponding folds in the heat exchanger plate, and are open at their outer edges; and

the condensing chambers are open at their inner edges, and are sealed at their outer edges by corresponding folds in the heat exchanger plate.

15. The heat exchanger of claim 14 further comprising a first end plate and a second end plate arranged substantially perpendicular to the axis of rotation, the folded heat exchanger plate mounted between the first and second end plates and cooperating with the heat exchanger plate so as to seal the evaporating chambers from the condensing chamber

16. The heat exchanger of claim 15 wherein the distiller further includes a sump containing the liquid to be distilled, the heat exchanger further comprising a plurality of liquid feed distribution ports extending through the second end plate such that a liquid flow path exists between the sump and the evaporating chambers via the liquid feed distribution ports during rotation of the heat exchanger plate.

17. The heat exchanger of claim 15 wherein the distiller further includes a sump containing the liquid to be distilled, the heat exchanger further comprising:

at least one rotary scoop tube coupled to the second end plate and extending into the sump; and

a plurality of liquid feed distribution ports extending through the second end plate, the at least one rotary scoop tube and the liquid feed distribution ports cooperating to provide a liquid flow path between the sump and the evaporating chambers during rotation of the heat exchanger plate.

18. The heat exchanger of claim 16 further comprising:

a flange mounted to an outer diameter edge of the first end plate opposite the heat exchanger plate, the flange cooperating with the first end plate to define a condensate collection space therebetween;

a plurality of condensate ports extending through the first end plate, the condensate ports providing fluid communication between condensate chambers defined by the [illegible] heat exchanger plate and the condensate collection space; and

at least one stationary scoop tube extending into the condensate collection space so as to remove condensate therefrom.

19. The heat exchanger of claim 16 further comprising a liquid distribution ring mounted to the second end plate opposite the heat exchanger plate and enclosing the liquid feed distribution ports, wherein the at least one rotary scoop tube is mounted to the liquid distribution ring and delivers liquid from the sump to the ring during rotation of the heat exchanger plate.

20. The heat exchanger of claim 19 further comprising a restriction element disposed in the evaporating chambers for generating a thin-film liquid flow on the panel surfaces of the evaporating chambers.

21. The heat exchanger of claim 20 further wherein each restriction element defines a corresponding gap in the respective evaporating chamber through which the liquid flows.

22. The heat exchanger of claim 18 further comprising an annular weir mounted to the flange and extending into the condensate collection space, the weir configured to generate a column of condensate blocking the condensate ports in the first end plate.

[illegible]. The heat exchanger of claim [illegible] wherein the [illegible] of the heat exchanger plate are co-planar with the axis of rotation.

24. A method of fabricating a heat exchanger plate for use in a distiller, the method comprising the steps of:

providing a substantially rectangular heat exchanger plate having at least two opposing, parallel edges;

folding the heat exchanger plate accordion style such that the folds are substantially parallel to the at least two edges; and

joining the at least two opposing ends of the heat exchanger plate so as to give the folded plate a generally circular shape.

25. The method of claim 24 wherein the circular-shaped heat exchanger plate defines a central axis, the method further comprising the steps of:

providing first and second end plates; and

mounting the folded heat exchanger plate between the first and a second end plates such that the first and second end plates are substantially perpendicular to the central axis of the folded heat exchanger plate.